Contactless Card Read/Write Module
OMT-YW202
User's Manual

(Version 1.4)

English

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1 Summary

YW-201 contactless card Read/Write module was designed on high integrated reader ICs for contactless communication on 13.56MHz of Philips.YW-201 integrates MF RC531 RF base station . Engineers need not take care how to control MF RC531RF base station. Just send command to module over IIC or UART.

YW-200 series contactless card Read/Write module support ISO14443-A Mifare One S50,S70，UltraLight，MifarePro,ISO14443-B SR176, ISO15693 ,I CODE SL2 and then other compatible card.

2 YW-200 Series Module

Type	Card Protocol	Vcc	Interface	Card supported	This Page
YW-201	ISO14443-A	+5V	IIC,UART(TTL)	Mifare S50,S70，Mifare Pro	
YW-202	ISO14443-A ISO14443-B	+3.3V~+5V	IIC,UART(TTL)	Mifare S50,S70，Mifare Pro，ISO14443-B SR512	√
YW-203	ISO15693	+3.3V~+5V	IIC,UART(TTL)	ICode SL2, ISO15693	
YW-204	ISO14443-A ISO14443-B ISO15693	+3.3V~+5V	IIC,UART(TTL)	Mifare S50,S70，Mifare Pro，ISO14443-B SR176，ICode SL2, ISO15693	

3 YW-201 Characteristic

☞Completely operation of Mifare One through simple command set.

☞Communication Protocol:

1. **UART**: Baud Rate 19200bps。
2. **IIC**：Max rate 400Kbps。

☞Auto request card: When the card put into antenna, the pin "CARDIN" will be low.

☞Package: DIP32.

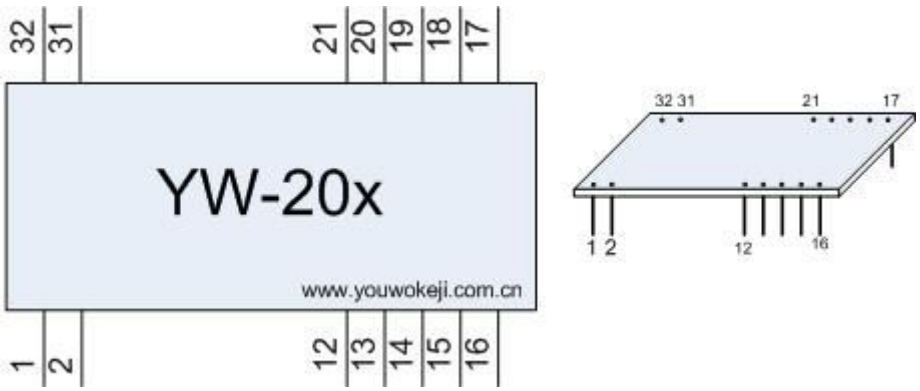
☞Power supply :+4.5~+5.5V.

☞Read Card distance 5~10cm.（Depend on the antenna）

☞You can get C51 source code example with theh module.

4 Function specification

4.1 Pin Function



Pic 1

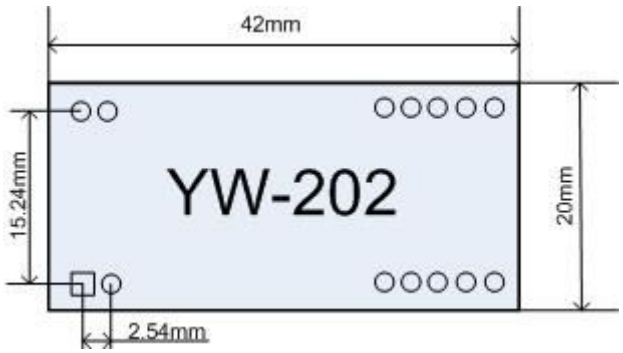
Pin function [Table **1**]:

Pin	Function	Description
1	RX	Antenna Receive
2	TGND	Antenna GND
12	NC	Not Use
13	NC	Not Use

14	CARDIN	Card In/Out Indicate(Only when auto request) 0:Card In. 1:Card Out.
15	TXD/SDA	UART TXD/ IIC SDA
16	RXD/SCL	UART RXD/ IIC SCL
17	VCC	+5V VCC
18	GND	GND
19	PORTSEL	Communication Protocol Selector (0: IIC, 1: UART)
20	NC	Not Use
21	NC	Not Use
31	TX1	Antenna Output 1
32	TX2	Antenna Output 2

Table 1

4.2 Dimension



Pic 2

5 Protocols

5.1 UART Protocols of Commands

Uart Protocols of Commands use data blocks.The format of data block :

1) Format of TXD（MCU → YW-201 Module）

	[STX]	[LEN]	[CMD]	[DATA]	[CHK]	[ETX]
Description	0x02	Package Length	Commad	The Content of n bytes	CheckSum	0x03

Number of Byte	1	1	1	n	1	1

Table 2

a) Asynchronism half duplex, 1 Start bit + 7 Data bits + 1 Stop bit.

b) The default transfer speed is 19200 bit/s.

c) Block Header STX=0x02, Block End ETX=0x03. From header to end ,but not include the header STX and the end ETX, if there is 0x02,0x03 or 0x10 , then must add 0x10 before it.

d) Block Header STX=0x02.

e) Package Length: the byte from Length itself to Checksum, but not include the added byte 0x10 due to 0x02,0x03 or 0x10.

f) Command: Refer to the Command List.

g) The Content of n bytes: the parameter.

h) CheckSum: XOR result from [**Length**] to then last byte of [**Content**], but not include the added byte 0x10 due to 0x02,0x03 or 0x10.

i) Block End ETX=0x02.

Example:

CMD: 0x10，DATA:0x00

Block Header:0x02。

LEN:0x04(=1Byte(Len) +1Byte(CMD)+1Byte(DATA)+1Byte(CHK))

CMD:0x10,0x10. (Add 0x01 before 0x10)

DATA:0x00。

CHECKSUM:0x14(=0x04^0x10^0x00)

Package Send:0x02,0x04,0x10,0x10,0x00,0x14,0x03.

2) Respond Format（YW-201module → MCU）

	[STX]	**[LEN]**	**[CMD]**	**[STATUS]**	**[DATA]**	**[CHK]**	**[ETX]**
Content	0x02	Package	Command	0x00：	The	CheckSum	0x03

		Length		Success 0xFF：Fail	Content of n bytes		
Num of Byte	1	1	1	1	n	1	1

Table 3

a) Asynchronism half duplex, 1 Start bit + 7 Data bits + 1 Stop bit.

b) The default transfer speed is 19200 bit/s.

c) Block Header STX=0x02, Block End ETX=0x03. From header to end ,but not include the header STX and the end ETX, if there is 0x02,0x03 or 0x10 , then must add 0x10 before it.

d) Block Header STX=0x02.

e) Package Length: the byte from Length itself to Checksum, but not include the added byte 0x10 due to 0x02,0x03 or 0x10.

f) Command: Refer to the Command List.When the MCU send the command to the module, the module send back this command to the MCU.

g) Status: Operation result. Success: 0x00. Fail: 0xFF.

h) During the communication, command content.

i) CheckSum: XOR result from [**Length**] to then last byte of [**Content**], but not include the added byte 0x10 due to 0x02,0x03 or 0x10.

j) Block End ETX=0x02.

5.2 IIC Protocol

1) Format of TXD(MCU → YW-20x Module)

	[Address of module]（W/R）	**[LEN]**	**[CMD]**	**[DATA]**	**[CHK]**
Content	Write：0xA0 Read：0xA1	Package Length	Command	The Content of n bytes	CheckSum
Num of Byte	1	1	1	n	1

Table 4

a) Address of module (W/R)：

b) When Write to module, the Address is 0xA0.

c) When Read from module, the Address is 0xA1.

d) Package Length: the byte from Length itself to Checksum.

e) Command: Refer to the Command List.

f) The Content of n bytes: the parameter.

g) CheckSum: XOR result from [**Length**] to then last byte of [**DATA**].

2) Respond Format(YW-20xmodule → MCU)

	[LEN]	[CMD]	[STATUS]	[DATA]	[CHK]
Content	Package Length	Command	0x00:Success 0xFF: Fail	The Content of n bytes	CheckSum
Num of Byte	1	1	1	n	1

Table 5

h) Package Length: the byte from Length itself to Checksum.

i) Command: Refer to the Command List.

j) Status: Operation result. Success: 0x00. Fail: 0xFF.

k) The Content of n bytes: the parameter.

l) CheckSum: XOR result from [**Length**] to then last byte of [**DATA**].

5.3 Switch of Uart and IIC

YW-201 Contactless card read/write module support UART and IIC, they can be switched by the port PORTSEL

PORTSEL = 1(High), UART is selected.

PORTSEL = 0(Low), IIC is selected.

6 Command List

	[CMD Name]	[Dir]	[LEN]	[CMD]	[STATUS and DATA]	[Description]
System Command						
1	Modue Setting	Send	0x04	0x01	0x00 0x01 0x02 0x03	4 combination with bit0 and bit1: Antenna Status（BIT0） 0：Turn off Antenna 1：Turn on Antenna Auto Request(BIT1) 0：Turn off Auto Request 1：Turn on Auto Request
		Return	0x04	0x01	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
2	Power Setting	Send	0x03	0x02		
		Return	0x04	0x02	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
Contactless card Command						
3	Request Card	Send	0x04	0x10	0x00 0x01	Request card mode： 0x00: request all card in antenna area 0x01: request card that have not halted in antenna area
		Return	0x08	0x10	0x00 Serial No	Status: 0x00: Request success + Card Serial No(4 bytes). 0xFF: Request Fail.
			0x04		0xFF	
4	Read Block	Send	0x0B	0x11	8Byte	Key Set(1Byte)＋Block No(1Byte) + Key(6Bytes) a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）

						->0~31
		Return	0x14	0x11	0x00 Data	0x00: Success, 16 bytes of data return.
			0x04		0xFF	0xFF: Fail
5	Write Block	Send	0x1B	0x12	24bytes	Key set(1Byte)＋Block No(1Byte)＋Key(6Bytes)+ Data(16Bytes) a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）->0~31
		Return	0x04	0x12	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
6	Read Sector	Send	0x0B	0x13	8bytes	Key Set(1Byte)＋Index of Sector(1Byte)＋Key(6Bytes） a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）->0~31
		Return	0x44	0x13	0x00 Data	0x00：success, 64bytes of data return.
			0x04	0x13	0xFF	0xFF：Fail
7	Initialize purse	Send	0x0F	0x14	12Bytes	Key Set(1Byte)＋Index of Block(1Byte)＋Key(6Bytes)＋Purse Initial Value (4Bytes,LSB) a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）

						->0~31
		Return	0x04	0x14	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
8	Read purse	Send	0x0B	0x15	8Bytes	Key Set(1Byte)＋Index of Block(1Byte)＋Key(6Bytes) a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）->0~31
		Return	0x08	0x15	0x00 Data	0x00: Success, 4bytes of purse value(LSB)
			0x04		0xFF	0xFF: Fail
9	decrement	Send	0x0F	0x16	12Byes	Key Set(1Byte)＋Index of Block(1Byte)＋Key(6Bytes)＋value of decrement(4Bytes,LSB) a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）->0~31
		Return	0x04	0x16	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
10	Increment	Send	0x0F	0x17	12Bytes	Key Set(1Byte)＋Index of Block(1Byte)＋Key(6Bytes)＋value of Increment(4Bytes,LSB) a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）->0~31

		Return	0x04	0x17	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
11	Purse backup	Send	0x0C	0x18	9Bytes	Key Set(1Byte)＋Index of Block(1Byte)＋Index of Block Backup(1Byte)＋Key(6Byte) a.Key Set(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)->0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7）->0~31 ps: the index of block and the backup block must be in the same sector.
		Return	0x0C	0x18	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
12	Card Halt	Send	0x03	0x19		
		Return	0x04	0x19	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
13	Key Download	Send	0x0A	0x1A	Index of key(1Byte,0~31）＋Key（6Bytes）	
		Return	0x04	0x1A	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
14	Read EEPROM	Send	0x06	0x1B		Address(2Bytes)＋Legnth(1Bytes) Ps: Address: High byte afront Length: not more than 16
		Return	n+4	0x1B	0 x 0 0 Data	0x00： success, n(Length) bytes of data return.
			0x04		0xFF	0xFF: fail
15	Write	Send	n＋5	0x1C	N bytes data	Address(2Bytes)+Data(nBytes)

	EEPROM					Ps: Address: High byte afront Data：not more than 16 bytes.
		Return	0x04	0x1C	0x00 0xFF	Status： 0x00：Success 0xFF：Fail
16	Type B CPUCard Reset	Send	0x03	0x1F		
		Return	0x04	0x1F	0x00 0xFF	0x00： Success， Information about reset 0xFF：Fail
17	Send COS Type B CPUCard	Send	n+3	0x20		Send COS of n Bytes
		Return	0x04	0x20	0x00 0xFF	0x00：Success。 0xFF：Fail
18	Type B CPUCard Sleep	Send	0x07	0x21	4Bytes	Card No
		Return	0x04	0x21	0x00 0xFF	0x00：Success。 0xFF：Fail
19	Get SR512 ChipID (Inculde Select)	Send	0x03	0x23		
		Return	0x05	0x23	0x00	ChipID(1 Bytes)
			04	0x23	Others	
20	Get SR512 UID	Send	0x03	0x24		
		Return	0x0C	0x24	0x00+8UID	Success: UID 8 Bytes
			0x04	0x24	Others	Fail
21	ReadSR512 Block Data	Send	0x04	0x26	Block Addr (1Byte)	
		Return	0x08	0x26	0x00	Block Data (4 Bytes)
			0x04	0x26	Others	Fail
22	Write	Send	0x08	0x27	Block	Block Addr(1Byte)+Data(4Byte)

	SR512 Block				Addr(1Byte)+ Data(4Byte)	
		Return	0x04	0x27	0x00	Success
					Others	Fail
23	SR512 Completion	Send	0x03	0x28		
		Return	0x04	0x28	0x00	Success
					Others	Fail
24	SR512 Reset To Inventory	Send	0x03	0x25		
		Return	0x04	0x25	0x00	Success
25	Mifare Card write Multi-block	send	0x0C+n *16	0x29		Key set(1Byte)＋Start Block No(1Byte)＋ Block number(1Byte)+Key(6Bytes)+ Data(16Bytes*Blocknumber) ***a.Key Set***(1Byte)： Select Key A,B(BIT0)->0:Key A;1:Key B Key Mode(BIT1)-> 0:Use key passed. 1:Use key downloaded. b.Index of Key Downloaded(BIT2~BIT7） ->0~31 ***Block number***: <=4 block in general,but 4th in every sector is Key Configure Block. So you must pay attention during writing multi-block.
		return	0x04	0x29	status	0x00:Success Other:fail

Table 6

Turn on the antenna before the operation of contactless card.

7 Command test sample

Samples below are based on uart protocol.

6.1．Request card

Send：02 04 10 10 00 14 03

Receive：02 08 10 10 00 4D 56 A2 57 F6 03

6.2．Read block

Send：02 0B 11 00 3E FF FF FF FF FF FF 24 03

Receive：02 14 11 00 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 04 03

6.3．Write block

Send：02 1B 12 00 3E FF FF FF FF FF FF 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 36 03

Receive：02 04 12 00 16 03

6.4．Download key

Send：02 0A 1A 00 FF FF FF FF FF FF 10 10 03

Receive：02 0A 1A 00 FF FF FF FF FF FF 10 10 03

6.5．Initial purse

Send：02 0F 14 00 3D FF FF FF FF FF FF 01 00 00 00 27 03

Receive：02 04 14 00 10 10 03

6.6．Read purse

Send：02 0B 15 00 3D FF FF FF FF FF FF 23 03

Receive：02 08 15 00 10 02 00 00 00 1F 03

6.7．Increment of purse

Send：02 0F 16 00 3D FF FF FF FF FF FF 01 00 00 00 25 03

Receive：02 04 16 00 12 03

6.8．Decrement of purse

Send：02 0F 17 00 3D FF FF FF FF FF FF 01 00 00 00 24 03

Receive：02 04 17 00 13 03

6.9．Purse backup

6．9．1 initial purse 1

Send：02 0F 14 00 3D FF FF FF FF FF FF 01 00 00 00 27 03

Receive：02 04 14 00 10 10 03

6．9．2 initial purse 2

Send：02 0F 14 00 3C FF FF FF FF FF FF 05 00 00 00 22 03

Receive：02 04 14 00 10 10 03

6．9．3 purse backup from 1 to 2

Send：02 0C 18 00 3D 3C FF FF FF FF FF FF 15 03

Receive：02 04 18 00 1C 03

6．9．4 read purse 2

Send：02 0B 15 00 3C FF FF FF FF FF FF 22 03

Receive：02 08 15 00 FF 04 00 00 E6 03

6.10．Card halt

Send：02 10 03 19 1A 03

Receive：02 04 19 00 1D 03

6.11．Read RC531EEPROM

Send：02 06 1B 00 70 10 10 7D 03

Receive：02 14 1B 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0F 03

6.12．Write RC531EEPROM

Send：02 15 1C 00 70 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 79 03

Receive：02 04 1C 00 18 03

6.13．Module IDLE

Send：02 10 03 10 02 01 03

Receive：02 04 10 02 00 06 03

6.14．Module set

Send：02 04 01 00 05 03(turn off antenna)

Receive：02 04 01 00 05 03

Send：02 04 01 01 04 03(turn on antenna)

Receive：02 04 01 00 05 03

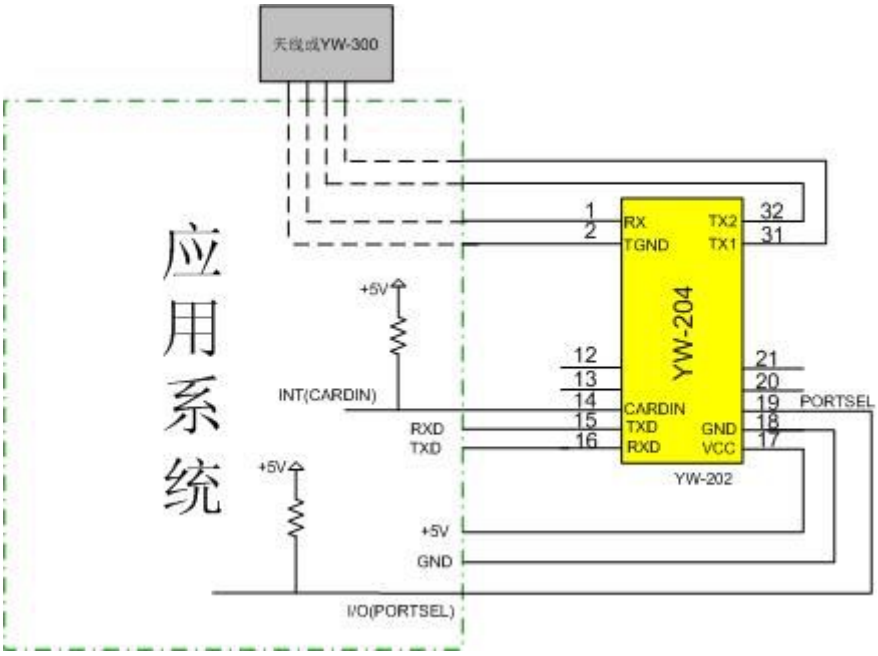
6.15 Mifare Write multi-block(3 block)

Send: 02 3C 29 60 04 10 03 FF FF FF FF FF FF 04 04 04 04 04 04 04 04 04 04 04 04 04 04 04 04 15 15 15 15 15

15 15 15 15 15 15 15 15 15 15 26 26 26 26 26 26 26 26 26 26 26 26 26 26 26 72 03

Receive: 02 04 29 00 2D 03

8 Application



Pic 3